Bachelor Thesis
Stockholm School of Economics
Center for Retailing
Spring 16/5 2024

To Generate or not To Generate, That is the Prompt

Implications of Generative AI Upon Startups Heavily Reliant on Software Development

Desnica, Aleksandar & Ängehult, Isak

Supervisors:
Alexander Mafael & Jonas Colliander

Acknowledgements

We would like to express great gratitude to our supervisors Alexander Mafael & Jonas Colliander, for tutoring us and guiding us throughout our work. We would also like to thank all company representatives who gave us the necessary insights during our interviews to write this thesis.

Aleksandar Desnica (50710) & Isak Ängehult (50761)

Abstract

The rapid consumer adoption of generative AI tools, like ChatGPT's achievement of 100 million active users within two months of release, underscores the swift impact of generative artificial intelligence (AI) technologies. This Bachelor's thesis investigates the profound impact of generative AI on startups heavily engaged in software development. Adopting a qualitative methodology and an abductive approach, we utilize semi-structured interviews with key respondents such as Co-founders from various startups to probe the integration and effects of generative AI tools. These discussions reveal that generative AI significantly improves efficiency in software development tasks, leading to accelerated iteration cycles and alterations in team dynamics and project management. A key finding of our thesis is that generative AI streamlines operations through increased productivity but also reduces prevalent startup risks of failure. The study shows that generative AI has significant implications for human capital management within startups, highlighting a shift towards skills that complement AI capabilities, such as adaptability and continuous learning. This thesis addresses the complexities and dynamic nature of technology-driven business environments by incorporating insights gained from generative AI applications. This enhancement aids startups in strategically integrating AI into their core operations and decision-making processes. As such we provide practical insights for Co-founders and entrepreneurs, facilitating more informed decisions about AI adoption and integration. The research also outlines key considerations for future studies, suggesting a broader examination of generative AI's long-term impacts across diverse industries and business models.

Keywords

Generative AI, Startups, Software development practices, Human capital, Risk aversion

Table of Content

1. Introduction

1.1 Background and problem area

By 2023, forecasts indicate that the worldwide market for generative artificial intelligence (AI) will achieve a value of $44.89 billion, with projections showing a 24.40% compound annual growth rate (CAGR), leading to an anticipated market worth of $207 billion by 2030 (Statista, 2024).

Although Large Language Models (LLMs) as a segment of AI are a recent innovation, earlier AI forms and their impacts have been extensively discussed in academic circles (Brynjolfsson et al., 2023; Furman and Seamans, 2019; Puranam, 2021). Previous AI research limitations meant that nonroutine tasks, which were challenging to codify, seemed immune to automation. This was particularly true for earlier technological advancements, primarily automated jobs, requiring lower skills (Autor et al., 2003; Acemoglu and Restrepo, 2019; Goldin and Katz, 1996; Autor and Dorn, 2013; Autor, 2015).

Tasks requiring creativity were difficult to codify, such as writing and image creation, traditionally evaded automation. However, this trend has changed with the emergence of deep learning techniques powering generative AI systems (Noy and Zhang 2023).

The generative AI field gained renewed public attention with the releases of Dall-E 2 in September 2022 and ChatGPT in November 2022, both of which generate digital content from natural language prompts. The rapid consumer adoption of these tools, like ChatGPT's achievement of 100 million active users within two months of release, underscores the swift impact of generative AI technologies (Hu, 2023).

Therefore, it is understandable that the launch marked a significant shift in discussions about AI, with LLMs demonstrating surprising proficiency in creative, analytical, and writing tasks, even scoring highly in graduate and professional exams (Girotra et al., 2023; Geerling et al., 2023; Kung et al., 2023; Boussioux et al., 2023). As such, the emergence of sophisticated generative AI technologies raises renewed questions in the context of automation, which can either displace human roles entirely or augment human productivity (Acemoglu and Restrepo, 2019; Boustan et al., 2022; Kanazawa et al., 2022). Moreover, LLMs can enhance

individual productivity and achieve creative outputs comparable to human levels (Dell'Acqua et al., 2023; Bubeck et al., 2023; Noy and Zhang 2023; Berg et al., 2023; Girotra et al., 2023). The significant impact on creativity suggests AI should play a role in the future of organizing for innovation (Kittur et al., 2019; Amabile, 2020; Raj et al., 2023; Boussioux et al., 2023).

As such, the impact of LLMs on the work of organizations and individuals has become an ever more urgent topic of discussion among scholars, workers, companies, and governments (Agarwal et al., 2023; Iansiti and Lakhani, 2020; Berg et al., 2023).

Specifically considering the noteworthy influence on creativity, it is implied that AI should have a role in shaping the future of innovation management (Kittur et al., 2019; Amabile, 2020; Raj et al., 2023; Boussioux et al., 2023). Consequently, research regarding generative AI becomes particularly intriguing, and therefore our research objective is to investigate the overall impact of AI on software development practices, human capital shifts, and risk of failure factors relating to generative AI within organizations who heavily relies on software development.

Building on these observations, it is evident that smaller organizations commonly encounter difficulties arising from the absence of formal structures, constrained resources, and the lack of sustained strategic planning and mechanisms for continuous improvement (Cosenz and Bivona, 2020; Haksever, 1996). Furthermore, they face challenges due to a shortfall in the expertise and experience necessary for effective implementation (Liberman-Yaconi et al., 2010; Matt and Rauch, 2013). As a consequence, this study aims to explore how the present issue of generative AI is influencing the landscape of software development startups, in relation to their capabilities and strategic outcomes as there is currently no research concerning this issue.

1.2 Disposition

This study is divided into six different chapters, starting with an introduction that includes a description of the current state of generative AI research in a contextualized view, leading to what the study will contribute with, and lastly relevant delimitations. We then present the current state of research regarding this topic under the chapter literature review after which the third chapter, methodology, explains how we have conducted our data collection, through

in-depth interviews. We then move on to presenting our findings in the fourth chapter, using the results from the research's qualitative study, i.e. interviews. The fifth chapter includes a discussion of our findings including which effects can be viewed as takeaways. The sixth, and last chapter includes a conclusion, limitations of the research and managerial implications, concluding with recommendations for future research.

1.3 Research Gap

Research on earlier AI iterations and recent studies on LLMs indicate that these technologies significantly influence worker performance depending on different environments or specific tasks (Brynjolfsson et al., 2023; Noy and Zhang 2023; Choi and Schwarcz 2023; Dell'Acqua et al., 2023). The main conclusion is that skilled workers who are adept in utilizing AI, experience significant productivity gains within its application range, while AI can reduce performance if used for tasks outside its optimal application range (Dell'Acqua et al., 2023).

Although research has been conducted on the specific task of productivity improvements with the emergence of generative AI, a shortage of studies on such improvements in specific environments in the context of organization type has been identified (Peng et al., 2023). More broadly, the affected research areas experiencing calls to action within research are: 1) shift in collaboration between HI (Human Intelligence) and AI, (Anthony et al., 2023; Faraj and Leonardi, 2022; Feuerriegel et al., 2022), 2) how new roles will emerge and be created, (Barrett et al., 2012; Allen and Choudhury, 2022; Bailey et al., 2022; Sergeeva et al., 2020), 3) how adoption will be shaped by stakeholders in the organization and beyond (Sendak et al., 2020; Haefner et al., 2020), 4) new capabilities and strategies (Iansiti and Lakhani, 2020) and 5) new forms of organizing (Bailey et al., 2022; Beane and Leonardi, 2022).

With this study we aim to as a primary objective answer the previously stated numerous calls to action and delve into the realm of inspecting implications of generative AI upon software development processes, human capital shifts, and implications of risk of failure within organizations classified as startups. We have chosen to specifically focus on the implications for software development, which is the lifeblood that fuels numerous contemporary startups.

Secondary objective is to distill insights on how startups can harness generative AI in an efficient way to meet their goals of continued operation through mitigating prominent risks of failure.

1.4 Research Questions

To define the study's objective, the following research questions have been defined:

1. *What are the potential implications and benefits of generative AI on software development processes within startups?*
2. *What are the potential implications and benefits of generative AI on human capital within startups?*
3. *Can startups use these potential implications and benefits of generative AI to mitigate prominent risks of failure? If so, how?*

1.5 Delimitations

The research study is delimited in several aspects to capture, communicate, and comprehend the current implications of the identified phenomena upon the study's fields: Human Resource Management; Management and Organisation as well as Organisation Strategy. The first delimitation is narrowing the focus to investigating the implications upon startups within one specific geographical location and organization ecosystem. Therefore, the study concerns the startup ecosystem of Sweden, with only Swedish startups, and collects qualitative data from relevant stakeholders such as software developers, managers, and co-founders thereof. Secondly, the study is delimited by identifying organizations classified to be at an initial stage of their organization. Thirdly and lastly, study's depth is limited to software development-heavy companies, outlined by the prerequisite of the main product or service developed deemed to be heavily dependent on the employed software developer processes.

2. Literature Review

2.1 Generative ArtificialI Intelligence

Artificial intelligence can be defined as a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation (Chowdhury et al., 2022). LLMs are programmed as deep learning

algorithms, capable of executing a variety of natural language processing tasks. The overarching proficiency of LLMs in addressing domain-specific challenges constitutes a distinctive aspect in contrast to preceding AI technologies. As previously mentioned, the novel technology has achieved top scores in graduate and professional examinations (Girotra et al., 2023; Geerling et al., 2023; Kung et al., 2023; Boussioux et al., 2023). As such, the release of ChatGPT in November 2022 changed both the nature and urgency of the research area field (Dell'Acqua et al., 2023).

Initial investigations into the emerging class of LLMs indicate tangible enhancements in performance resulting from their application, particularly in domains such as writing tasks (Noy and Zhang, 2023), programming (Peng et al., 2023), as well as ideation and creative endeavors (Boussioux et al., 2023; Girotra et al., 2023). As such, an entirely new category of automation of labor has been introduced which is on the same level of capabilities as those of the highly educated and compensated as well as most creative workers (Eloundou et al., 2023).

Furthermore, conversational AI or LLMs systems have several key characteristics (Gkinko et al., 2023):

1. Human-like Competence: These systems demonstrate a capacity for human-like proficiency in executing specific tasks while engaging in natural language conversations with users.
2. Personality and Anthropomorphic Characteristics: Notably, these AI systems exhibit distinctive personalities and anthropomorphic traits (Bavaresco et al., 2020).
3. Continuous Development: The development of these systems is an ongoing process, marked by consistent learning from the content of users' inquiries and their interaction patterns.
4. Dependency on Continuous Use for Improvement: The sustained utilization of conversational AI is imperative for its continuous enhancement. This iterative process enables them to evolve and better align with users and organizational contexts, thereby fostering increased utilization.

As such, it is through these technical disparities from preceding machine learning forms, LLMs indicate a potentially swifter and more pervasive influence on the realm of work (Dell'Acqua et al., 2023).

The final salient characteristic of LLMs pertains to their inherent opacity. This opacity extends to the failure points of AI models, characterized by a propensity to produce inaccurate yet plausible outcomes, often termed as hallucinations or confabulations. Additionally, these models exhibit a susceptibility to various errors, including inaccuracies in mathematical computations and citation provision. Despite the substantial advantages afforded by AI, users encounter challenges in delineating when LLMs will excel and when they may falter, introducing an element of unpredictability (Dell'Acqua et al., 2023).

Further complicating the comprehension of LLMs is the absence of explicit guidance from developers regarding optimal utilization. Unlike conventional user manuals, developers refrain from providing exhaustive directives, prompting users to navigate through a process of trial and error. The optimal ways to employ these AI systems remain obscured and are often discerned through continual user experimentation (Dell'Acqua et al., 2023).

2.2 Software Startup Risk of Failure Factors

A Systematic Mapping Study (Paternoster et al., 2014) highlights the prevalent contextual attributes of startups, such as general scarcity of resources, heightened need for reactivity and adaptability, significant time constraints, uncertain circumstances, and the challenge of addressing rapidly expanding markets.

Software startups are nascent firms that lack a significant operational track record, specializing in the development of innovative products. The landscape within which software startups operate is very dynamic, unpredictable, and chaotic.

The common failure rate of startups calls for a more nuanced perception of state-of-the-practice of startup activity (Berg et al., 2018). The similarities shared between startups leads to coexistence of a constant new set of challenges (Sutton, S.M. 2000), and the stage that is affected the most is the early stage (i.e., from the conceptualization of an idea to the initial product launch). 90 percent of startups fail, despite the continuation of success stories in the world, and most by self-destruction rather than competition, which even more tells the story of why doing it right from the beginning is crucial (Laitinen & Senoo, 2019; Crowne, 2002).

The most common risk of failure factors stem from financial and market-related factors, such as insufficient funding, challenges in finding product-market fit, and difficulties in

assembling an entrepreneurial team. Beyond this, there are also additional challenges related to software development and innovation methods (Giardino et al., 2015).

By aiding in faster, informed decision-making, generative AI has the potential to significantly mitigate the risk of product-market misalignment, a notable cause of startup failure. This technology also addresses critical technical and knowledge-based challenges, further justifying the focus on software development startups for research (Pattyn, 2023; Wasserman, 2012).

2.3 Potential Impact of Generative AI on Risk of Failure Factors

Software-centric startups stand to gain significantly from generative AI's capability to automate tasks such as market analysis, customer insight generation, and product strategy development (Sjödin et al., 2021). The pivot to leveraging such AI tools could streamline the product development process, enhancing agility and precision in addressing market needs. Furthermore, the imperative for efficient software development practices is magnified in the startup context, where the agility offered by automated and AI-enhanced tasks can be a game-changer. This is especially relevant in exploring how software development practices adapt within agile development frameworks and the strategic adoption of open source software for prototyping purposes (Paternoster et al., 2014).

2.4 Impact of Generative AI on Worker Skills and Productivity

Within academic discourse, the concept of “machines replacing humans in the workplace” is considered outdated (Dwivedi et al., 2019; Wilson et al., 2019). Human workers have climbed the value chain, while AI is focusing more on enhancing instead of replacing human capacity, skills, and competencies to facilitate effective workplace collaboration (Dwivedi et al., 2019; Kumar, 2017). Rather than having a direct influence on worker productivity, workplace AI applications have an indirect influence through the development of new, modified, or unmodified worker routines or skills (Zirar et al., 2023). “Skills”, in this context, is “the ability to use one's knowledge and competencies to accomplish a set of goals or objectives” (Zirar et al., 2023).

However, jobs requiring repetitive tasks, such as data management and analysis, continual physical control of equipment, and individual evaluative interaction, have witnessed skill

displacement to AI in the workplace (Chuang, 2021). Conversely, the literature suggests that workers can derive benefits from developing sustainable skills, more challenging to replace with AI, such as critical thinking, problem-solving, communication, and teamwork, to coexist harmoniously with intelligent systems (Rampersad, 2020; Sousa and Wilks, 2018). This literature implies that humans engage in an ongoing race with workplace AI to acquire new skills that are intricate for AI to perform, constituting a “symbiotic relationship” (Zirar et al., 2023).

In addition, when accounting for other generative models and complementary technologies, estimates indicate that up to 49% of workers could have half or more of their tasks exposed to LLMs. While there are numerous low-wage occupations with high exposure and high-wage occupations with low exposure, the overall trend reveals that higher wages are associated with increased exposure to LLMs (Eloundou et al., 2023; Noy and Zhang, 2023).

Productivity on the other hand, in essence, serves as a straightforward gauge of efficiency, calculated by dividing outputs generated by inputs invested. A more expansive perspective conceptualizes productivity as an evaluation of production efficiency, covering the conversion of resources into desired outcomes. In this context, resources span a spectrum from tangible goods to time, while outputs may denote completed products or accomplished tasks (Kenton et al., 2024). Increasing productivity implies achieving more results utilizing the same or fewer resources, thereby constituting a direct trajectory for organizational growth.

In terms of measuring productivity, literature was reviewed on two separate ends of the nature of the job task spectrum, namely consulting and programming have shown promising results. This was done to best gauge quantitatively the possibilities, as quantitative work is still early and while industry exposure research has been performed, no overarching and conclusive task-specific research has been performed on a detailed level (Felten et al., 2023). For instance, consultants utilizing AI exhibited a substantial increase in productivity, accomplishing an average of 12.2% more tasks and completing tasks 25.1% more swiftly. Furthermore, the results produced by these consultants were of significantly higher quality, surpassing the control group by more than 40% (Dell'Acqua et al., 2023). Similarly, programmers' effects were tasks being completed 55.8% faster where developers with less programming experience and those who program more hours per day benefited the most (Peng et al., 2023). This presents an important trend: the most significant beneficiaries of

using AI are the bottom-half-skill subjects, consistent with findings from Noy and Zhang (2023) and Choi and Schwarcz (2023). Lastly, the literature has pointed out that augmenting tasks and automated tasks are interlinked and that the one eventually can not happen without the other (Raisch and Krakowski, 2020).

2.5 Generative AI in Facilitating Innovation

The AI revolution is often referred to as Industry 4.0, the fourth industrial revolution, which according to experts is the most substantial yet (Zohaib, 2023). It is predicted to have a greater impact than both the technological revolution (2.0) and the digital revolution (3.0) combined (Giuggioli and Pellegrini, 2022). It is predicted that industry 4.0 firms will use AI to manage finance, legal, and day-to-day operations, which everyone can benefit from, especially those with scarce resources (Susskind and Susskind, 2018).

The venture capital investing toward startups that effectively incorporate AI is high right now, making it even more attractive for startups to use it (Chalmers et al., 2020).
A stage where we are likely to see much gains from AI use is in the early stages of entrepreneurship, when generative AI becomes available for all it means that knowledge has been democratized. The knowledge that was only attainable by higher level education, or by employment, is now easily accessed by everyone (Yue, 2023), even financial models and forecasts can now be done by AI which makes the barriers to entry lower from an entrepreneurial standpoint. The entrepreneur and his/her team can leverage AI to focus their time on creative, social, and leadership tasks, and let machines take care of repetition, speed, and scalability, which generally startups have the most to gain from since resources are scarce (Wilson and Daugherty, 2018). More ventures are set to be made since the funding needed diminishes due to the lower cost of running (Shane and Venkataraman, 2000). At the same time, this will lead to a more diverse and numbersome source of new ideas, which can make it harder for new startups (Giuggioli and Pellegrini, 2022).

3. Methodology

3.1 Research method and approach

3.1.1. Research method

The research method chosen for this study was the qualitative research method. The main motivation for selection of this research method was that it allows for theory emergence through points of view of participants while also enabling exploration of subject's meaning through rich data (Bell et al., 2022). While on the opposite end of the spectrum, a quantitative research method was deemed too risky for the subject due to risk of researcher point of view biases, generalization as well as lessened flexibility and adjustments for each respondent.
In order to facilitate the highest degree of flexibility in the research process, semi-structured interviews were selected as the interview method. Throughout the course of the interviews, current industry partakers, experts and stakeholders expressed their opinions on "Implications of generative AI on startups". It was the aggregated aspects and points of view that allowed for a deep and rich exploration of various underlying factors, relationships and variables at play, within the software startup industry with the rise of generative AI.
This approach was essential in order to comprehend the benefits seeked from generative AI within respondents' startup endeavors while also mapping first-order categories, second-order themes and theoretical dimensions. Respondents spoke freely about various topics and offered different viewpoints, challenging certain aspects. This approach opened up opportunities for the research to explore new topics within the field. Furthermore, a predetermined list of interview themes was not established, as most of the participants introduced new categories for deeper understanding and coding.

3.1.2. Research approach

For the research approach, the selection of an abductive approach was driven by the novelty of the subject concerning software-centric startups and the emergence of generative AI in Sweden. This strategy blends the processes of generating theories from observed data and testing theories against observations, thereby crafting discussion and conclusions grounded in both novel empirical discoveries and established scholarly work (Andersen,1998). It's particularly effective for this inquiry due to its iterative nature, which accommodates the

continuous incorporation of emergent themes and insights into the various complexities of AI in business research literature (Taylor et al., 2002; Flick, 2015). Therefore, the methodology is apt for probing into the ways specific variables might influence, drive, or modify the landscape of software-centric startups in Sweden. Throughout this exploration, the introduction of new concepts and discussions prompted a reevaluation and enrichment of the study with further academic resources and detailed interview feedback.

3.2 Data Collection

3.2.1 Selection of Study Participants

In order to thoroughly collect, comprehend and evaluate implications of generative AI on software-centric startups, gathering insights from a specific selection of participants was considered essential. As such, literature review was performed separately for defining startup selection criteria. This resulted in outlining a definition to guide the study's selection of participants, while keeping in mind time and resource limitation face in the study, to be startups:

1. Characterized primarily by innovative software product development (Blank, 2013).
2. Operating with a small team, between 2 to 25 employees were considered (Paternoster et al., 2014).
3. Focusing solely on startups in early stages which are still working on the concept and its initial development or are subject to reiteration cycles and are yet to find a product market fit (Giardino et al., 2015).

Furthermore, individuals with first-hand knowledge and experiences from implementation of generative AI within software-centric startups workflows were targeted. Selection was based on their professional roles and the companies they represented, with criteria being direct usage of generative AI tools within relevant discussion areas, managing the team utilizing such tools or being a part of leadership of a company developing such tools for businesses. As a result, interviews were held with representatives from a variety of recognized and prominent startup organizations that have adopted generative AI. Although company names are not disclosed, the companies included in the study are to a majority members or have recently been members of prominent startup incubators and accelerators such as SSE Business Lab, KTH Innovation Pre-Incubation Program and Y Combinator. The startup company sample includes company funding ranging from self-funded to the highest known of

€1.5m. This diversity was intentionally sought after, aiming to capture varied perspectives on the topic of generative AI and minimize the likelihood of biased outcomes (Bell et al., 2022). The respondents varied in age, gender and held different positions, deemed relevant, within their companies (CTO, Technology Competent Co-founder, Co-founder, CEO, Board Member), offering a wide range of insights into the study's questions.

Of the seventeen interviews conducted, four were in-person meetings in Stockholm, Sweden. Initial contacts with potential respondents for both the preliminary and main phases of the study were made via email or LinkedIn, with many of the representatives being referred by our professional network, by individuals previously interviewed, news sources or found as newest or past participants in mentioned accelerators and incubators.

Table 1. *Table of Main Study Interviews*

Role	Age	Gender	Company	Company Size	Short Company Description	Interview Format	Interview Date	Interview Length
Co-founder & CEO	52	Male (M)	Company A	6	Cloud Based platform with tools that combine quality safe and updated dataset for retail	In person	14-03-2024	00:40:47
Co-founder & CEO	29	M	Company B	4	Gather talent to deliver high impact solutions	Digital	20-03-2024	00:34:08
Co-founder & CEO	30	M	Company C	4	App solution that allows for sharing of electric vehicle chargers	Digital	17-03-2024	00:22:02
Co-founder	23	M	Company D	3	Co-Pilot for product managers	Digital	25-03-2024	00:29:35
Co-founder	22	M	Company E	4	Salary and benefits consultancy	Telephone - call	25-03-2024	00:17:14
Founder	50	M	Company F	5	AI solution for lawyers	In person	26-03-2024	00:45:00
CTO/Lead Developer	27	M	Company G	12	Marketplace platform for retail space rental	In person	26-03-2024	00:11:21

Growth Manager	28	M	Company G	12	Marketplace platform for retail space rental	In person	26-03-2024	00:16:19
Co-founder & CEO	35	Female (F)	Company H	2	Data platform for government entities to make informed decisions on food	Digital	27-03-2024	00:36:17
Executive chairman of the board	48	M	Company I	22	Generative AI platform for service automation at scale	Digital	27-03-2024	00:24:57
Co-founder & CTO	23	M	Company J	2	Edtech company for career guidance	Digital	28-03-2024	00:33:38
Co-founder & CEO	30	F	Company K	4	Task automation solution	Digital	28-03-2024	00:25:09
Co-founder & CTO/CEO	25	M	Company L	4	Mobile app development and consultancy company	Digital	02-04-2024	00:19:44
Co-founder	34	M	Company M	2	Cutting edge AI tool and analytics to forecast trends and gain insights	Digital	02-04-2024	00:18:56
Co-founder	54	M	Company N	4	Royalty free music platform	Digital	03-04-2024	00:24:48
Co-founder	24	M	Company O	2	Capability evaluations software for foundation models and LLM-agents benchmarking	Digital	06-04-2024	00:20:13
Co-founder & CTO	40	M	Company P	9	Creators payment software acting as a merchant of record	Digital	09-04-2025	01:01:20

3.2.2 Pre-study

Literature research and four guiding interviews were conducted as part of the pre-study phase in order to identify the current state of various different industry startups in Sweden. Moreover, the objective with this pre-step was to explore which category of startups and

different skills needed for their workings was seen to be most affected by the generative AI phenomena while also aiming to detect potential gaps where there is a need for further exploration.

The first two interviews within the pre-study were with a partnership manager/technical coach and a program manager/coach at SSE Business Lab. These two interviews provided an understanding of the various contemporary challenges coupled with the phenomenon and utilization areas by SSE business labs startups, helping to identify a specific category of startups to focus on.

The third interview was with a SSE Phd alum and research professor within AI who as well teaches a startup course at SSE. This interview provided support in the design of the interview process after narrowing down a specific category of startups together with discussion about the chosen field study, leading in developing the research questions of the study.

Last interview of the pre-study phase was with a head of product development and one of the first employees of the $0.25b ethereum blockchain developer platform Tenderly. This interview provided a test on the interview questionnaire and with open ended questions helped increase our knowledge with up to date information about software startups and expand further themes to be touched upon coming from an individual who had been through all stages of a startup up to now being regarded as a scaleup.

Concluding, in the first phase, the people we interviewed also suggested people that could be relevant for us to interview further both in the pre-study as well as in the main-study.

3.2.3. Main study

Prior to commencing the primary research phase, it was determined that the total number of interviews would be contingent upon reaching theoretical saturation (Bell et al., 2022).
In continuation, it is suggested that a minimum of 10-15 interviews is advisable to ensure comprehensive coverage of the subject matter (Ahrne and Svensson, 2011). Consequently, the main study consisted of 17 interviews. Among these, 17 unique participants were interviewed from 16 different companies, with the only two individuals coming from the

same company, being interviewed on two separate occasions.
Additionally, the duration of the interviews varied from 00:11:21 to 01:01:20. The decision not to impose a strict time limit was made to allow respondents the flexibility to offer more detailed responses when necessary and to enable the researchers to delve into topics as deeply as needed without the constraints of a predefined time frame as well as suggest further themes that may impact updating of the semi-structured questions.

The interviews were held from the 14th of March until the 9th of April, 2024. Interviews were conducted in person, on various online conference meeting applications (Microsoft teams, Google meets) and on the phone, as specified in Table 1.

Key themes, as outlined in Appendix Table 4., were employed to steer the interviews towards gathering data in specific domains, minimizing the need for extensive direction. This strategy aimed to reduce the potential for researcher bias (Bell et al., 2022). Furthermore, essential questions, detailed in Appendix Table 3., were formulated and utilized throughout the interviews to probe aspects related to the phenomena observed initially and as the interviews progressed. These questions were revised in combination with new literature before and after each session, informed by preparatory research on each participant, to ensure the capture of most optimal insights. Employing a flexible question framework in this way, as opposed to a rigid question set, mitigates the risk of missing valuable insights (Bell et al., 2022).

With the respondents consent, the sessions were recorded and immediately transcribed to ensure accuracy and prevent misunderstandings (Ahrne and Svensson, 2011). Direct transcription from the recordings was crucial, especially since only one interview was conducted in English. This approach ensured that the transcripts accurately captured the respondents' intended messages.

3.3 Data Analysis

The quotes included in the paper were meticulously chosen by the authors, emphasizing areas where similarities and differences aligned with the study's primary themes, as delineated in Table 4. of the Appendix. The Gioia methodology, known for its compatibility with abductive research strategies like this one, was employed to interpret and structure the key themes found in Table 4. of the Appendix (Gioia et al., 2013, Magnani and Gioia, 2023).

Initially, the empirical data was transcribed and compiled into a document for thorough review by the researchers. This involved multiple readings of the transcripts to ensure a comprehensive understanding of the content. Data reflecting common conceptual themes or analogies were then grouped into first-order categories. These initial themes were further consolidated into broader categories, identifying three main themes: (1) Implications of Generative AI on software development processes, (2) Shift in value of Human Capital , (3) Software-centric startup market implications. These themes, largely unexplored within the context of the Swedish market and globally, directly inform the research questions posed in this paper (Gioia et al., 2013, Magnani and Gioia, 2023). Subsequently, these first-order themes were abstracted into second-order themes and organized into aggregated dimensions, with Table 2. in the paper providing a visual summary of this structured data analysis. Data coding was performed separately and individually by the authors during two separate individual coding occasions, with the latter being post discussion of the first individual data coding round. After the second such individual analysis authors consolidated and reached consensus on the different categories, themes and dimensions. Depicted in Figure 1.

Categories, themes and aggregated theoretical dimensions

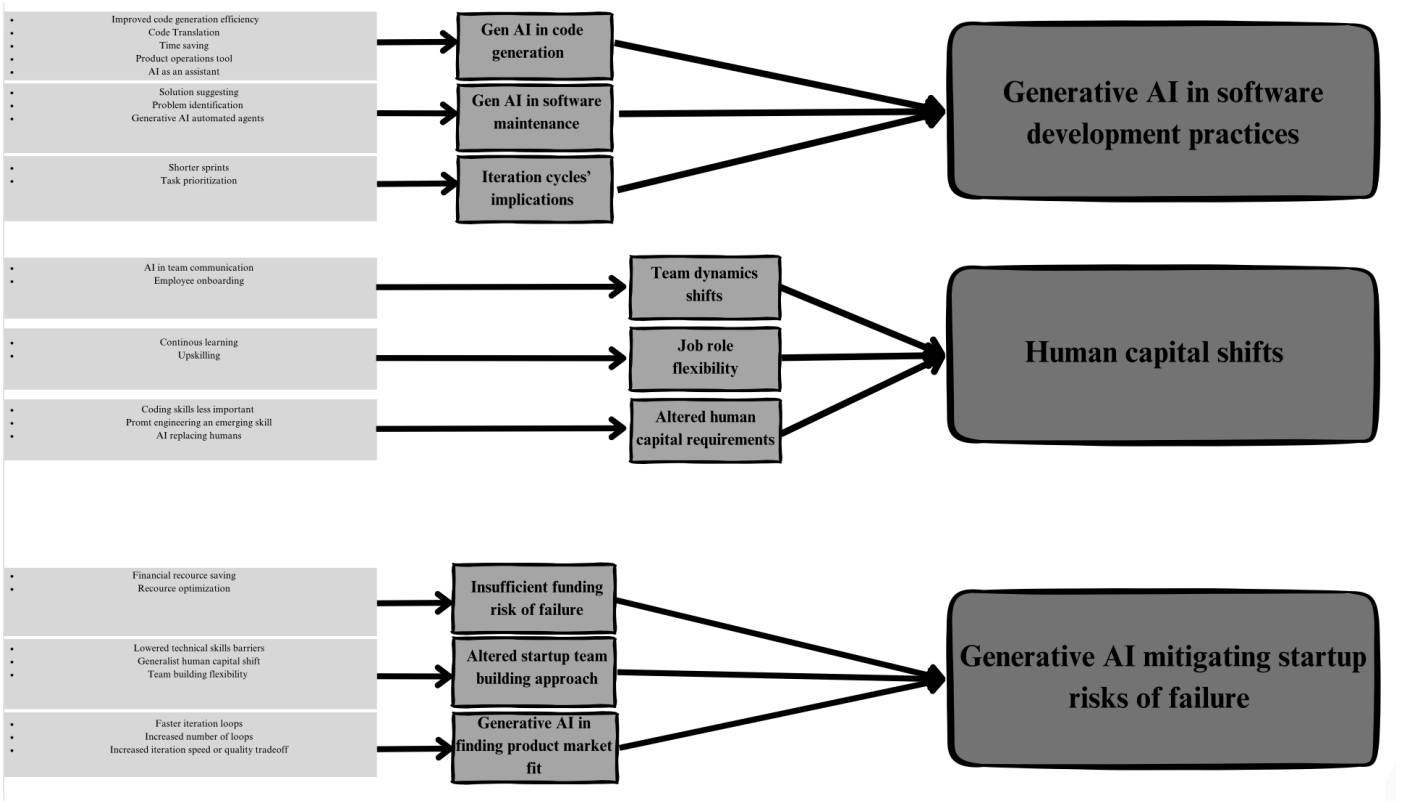


Figure 1. Data Structure (From left to right: 1st Order Categories, 2nd Order Themes, Aggregate theoretical dimensions)

3.4 Quality of Research

3.4.1 Reliability and validity of the study

Qualitative studies often face the challenge of the researchers' subjectivity influencing the results (Ahrne and Svensson, 2011). To enhance the study's validity and mitigate these concerns, one company representative whose relevance to technical questions was deemed lesser was later supplemented from an additional interview with a more technical company representative. This follow-up session allowed for the clarification of initial responses and

additional inquiries into phenomenon experiences, addressing areas where the data had not yet reached saturation (Bell et al., 2022).

Moreover, selecting respondents from diverse backgrounds aimed to reduce the impact of individual biases on the study's findings (Ahrne and Svensson, 2011). Sharing the draft of the study with all participants before finalization sought to align interpretations with participants' perspectives, thereby increasing the work's reliability, trustworthiness, and authenticity (Vázquez, 2012).

Nonetheless, specific individuals for interviews inherently limits the randomness of participant selection, potentially biasing the outcomes (Bell et al., 2022; Ahrne and Svensson, 2011). This approach constrains the generalizability of the research findings, as it employs a non-random sample that may not accurately represent the broader population (Bell et al., 2022; Ahrne and Svensson, 2011).

The subjective nature of qualitative research, inherent in interview-based methodologies, poses a limitation by relying on participants' personal perspectives. This subjectivity is further compounded in semi-structured interviews, where variability in questions and responses across sessions can complicate the analysis of empirical data, specifically in when analyzing the similarities and differences within the empirics. The researchers' selection of specific quotes for inclusion in the study introduces an additional layer of potential bias, as this selection process may reflect their subjective judgments (Ahrne and Svensson, 2011).

3.4.2. Ethical considerations

At the beginning of each interview, participants were briefed on how their data would be managed. Additionally, participants were informed about data handling practices in compliance with GDPR regulations. Specifically, they were assured that no confidential information, including their names or companies, would be disclosed in the report—only their professional titles would be mentioned and gender. Including titles is considered essential as it provides the reader with valuable context, enhancing understanding and confidence in the respondents expertise. Nevertheless, to maintain the study's objectivity and safeguard respondents' privacy, details such as age and personal names were omitted from the

report. This approach was chosen to encourage candid participation from respondents without concern for their privacy and to prevent potential cognitive biases among readers (Bell et al., 2022).

4. Findings & Analysis

For a detailed overview of findings and how quotes were organized in the different categories, themes and dimensions please refer to Table 2.

4.1 Generative AI in Software Development Practices

4.1.1 Generative AI in code generation

The advent of generative AI has had significant repercussions in the domain of code generation, a trend poised to persist into the future.
A CEO (B1) notes that a prominent use case of generative AI for code generation is *"A mix of those who use it somewhat as a sounding-board. Questions, answers, in their iterative process (...) generating code that they can then implement and test"*. It has been denoted as a part of an initial way of working, decided by teams to maximize output. A Co-founder (D1) elaborated on this, stating that *"With the value to be gained In Codegen, ChatGPT/generative AI can help speed up the work that developers do and that automatically proves more efficient"*.

A CO-founder (E1) states that with generative AI "*A one x-er can be basically as skilled as a 10x-er"* referring to skill level of the coder. A 10x-er is referring to a programmer that is 10 times more efficient. This is also echoed by a lead developer (G2) *"I think you could do more as a junior maybe if you have the tools helping you"*.

Another aspect of code generation in relation to generative AI is using AI as an assistant to help you with time savings and fill skill gaps. *"It works mostly as an assistant, almost. It can improve how the process gets started. (...) It can directly come with suggestions and different ways you can build it up or what gets started quickly and of course you avoid sitting there and writing code",* says a CO-founder (E1).

*A*dding to the time allocation benefits, a CEO (L1) notes that *“you can think more about how you structure it”,* referring to generative AI freeing up the time from writing code to think more of creative output.
Code translation is also an area where generative AI is helping startups in a meaningful way, a CEO & Co-founder (C1) exemplifies the specific structural usage in code-generation while adding the trans-language possibility in coding with generative AI by stating *“If you know which language it should be written in, then you can just say hello I want a function (...) then it just solves it. If it happens that you find code that works in Python but you need it in C++ then you say hey I have code in Python can you adjust it to C++ and it says yes here it is”.*

4.1.2 Generative AI in software maintenance

From the interviews, it can be concluded that software-centric startups are experiencing an increase in productivity while exploring a diverse utilization of generative AI within software maintenance processes.

A CEO (B1) describes generative AI in a maintenance perspective in that *"It's about getting those early ideas and suggestions for solutions, or what you can do is process a lot of code very thoroughly and specifically. Then try to pinpoint certain issues”*. These empirics are in line with literature which collectively highlight LLMs capability to enhance individual productivity through creative outputs and performance improvements in tasks historically considered difficult to automate, such as writing and programming (Dell’Acqua et al., 2023; Bubeck et al., 2023; Noy and Zhang 2023; Berg et al., 2023; Girotra et al., 2023).

With the effect identified, what can be derived from the interviews are the various roles generative AI tools assume in human to AI work augmentation, which in this context it acts as an assistant, work reviewer, source of inspiration and to some degree work executer while always subject to human review. A Co-Founder (E1) portrays this as *"Agents that collaborate and solve tasks that we want to get done. So if I have a page, I want to get all that information on these PMFs into data, then he (CTO), has an AI team with him, with different agents that essentially communicate with each other and solve this task”*.

Moreover, in regards to automated AI agents, it is spoken on by Co-founder (J1) "*create a user, a fake user with generative AI, and let that be the feedback point (...). You can use it as your user feedback on how this is experienced"*.

Work execution is prevalent in software maintenance and debugging while its work is augmented and not fully automated as it is subject to developer review in order to confirm that the human to AI work intention was matched. This is further in line with literature suggesting augmentation of a dual effect where AI can either substitute or complement human labor depending on the context and implementation (Acemoglu and Restrepo, 2019). CEO C1 agrees that *"It's definitely an efficient way to handle errors and search for what could be wrong"* in relation to if generative AI makes for more efficient debugging.

4.1.3 Iteration cycles implications

Iteration cycles in relation to software development, is the practice of continuously improving models through successive testing and tweaking.
"Just there like how quickly we can write codes, quickly we can iterate, quickly we can learn, can affect our ability to find product market fit" says a CEO (B1) marking a profound shift in that reiteration cycles have become faster than before prompting an increased focus on gaining user feedback for future reiterations to take place.

A Co-founder (J1) adds further to the argument that iteration is directly coupled with the likelihood of survival as *"Those who can get the most feedback from the market and build you into their product will have the best product they want and which will make you have a successful launch. It's like night and day"*.

Furthermore, with the emergence of generative AI, agents have come to be deployed that may act as a test user which is more dynamic in providing feedback and in effect to some extent replacing the need for human/end user feedback between reiteration cycles. This in effect, further improves the speed of reiteration cycles as obvious pitfalls are avoided before major software updates, launch all while development prioritization is made more clear. This is echoed by a Co-founder (J1) *"It's a whole different mindset in how quickly you can perform these sprints. Typically, our sprints usually last maybe four weeks or something (...). But now I can start talking about a few days. Weekly sprints, like. Daily sprints"*.

Further elaborations are made on iteration loops and in that generative AI contributes to shorter sprints and higher quality control, a Co-founder (K1) states that *“There will be those who see that you can do very much, very quickly, and ship at a very high level. I would say that the developers I work with, especially referring to my co-founder, (...), it feels like they do quality control more”.* A Co-founder (M1) agrees that “*With generative AI you can reduce your development costs and development time, you can have a faster iteration loop and many more of those loops in a much shorter time".*

4.2 Human Capital Shifts

4.2.1 Team dynamics shifts

The integration of generative AI technologies within team dynamics aims to enhance communication tools among team members and help foster a more smoother employee onboarding. *"The possibility for AI to help us communicate better, feel more secure, actually gather data on things that we might miss when we're talking but capture these aspects and help us optimize our perspective. That's what we need"* says a CEO (B1) when asked about how generative AI has impacted team dynamism.

A Co-Founder (D1) elaborates on how generative AI is impacting team communication “*developers don't like being in meetings, they don't like answering messages. So that's just the positive thing in that developers can do more within the context because a lot of the communication can be reduced”.* This due to the fact that generative AI solutions can help with communication between departments and reduce the need for meetings etc.
A CEO (K1) builds further on this analysis, stating that *"So I would say that the collaboration between tech and non-tech individuals can potentially improve (...). We aim to make a somewhat automatic translation of something complicated into something simple for those who need to handle it”.* Meaning that the communication will get simpler and a greater understanding among team members will occur with the introduction of generative AI tools.

It also gets easier in terms of employee onboarding, *“Instead of spending a lot of time writing documentation and manual onboarding documents, you could just give them this AI tool”* a Lead Developer (G2) says. Making it easier for new employees to integrate into the company

and faster become effective workers.

4.2.2 Job role flexibility

The introduction of generative AI doesn't only affect individual potential and performance it has also changed their flexibility within an organization, a CEO (C1) highlights the flexibility *"you become more flexible in what you can work with (role) if you can use ChatGPT"*. A Growth manager (G1) points out that *"there are possibilities due to generative AI to jump between different departments and roles with the help of the functions at hand"*.

A Co-founder (H1) describes that generative AI has helped with flexibility, *"I made mockups for platform development, which meant I didn't have to hire a designer and a coder because I could just do it super simply"*. A CEO (K1) implies that *"the collaboration between tech and non-tech individuals can at least potentially improve. And a tech person can also be more involved"*, AI works as a bridge, making people understand each other.

4.2.3 Altered human capital requirements

The first analysis that could be drawn in relation to human capital requirements is the reduction in dependency of industry specific skills, particularly in the early stages of a company. A Co-founder (D1) *"I think we're going to see a trend of startups being comprised more of generalists at an early stage and less dependency on hiring competence"*, according to a Co-founder (E1) *"this technology allows companies to defer hiring specialists, thereby increasing efficiency and reducing overhead costs"*.

As generative AI takes over more routine tasks, employees have more time to engage in direct communication with customers and in prospecting, this implies two things. First is that tasks done by junior employees may be reduced, but it can also help them develop into more capable employees, echoed by a Co-founder (E1), who believes that a *"one x-er can become equally capable as an 10x-er"*.

The second implication is that *"A higher level of social skills and empathy is now required from the employee, soft skills are more sought after"* says an executive chairman of the board (I1). Meaning that less technical and specialist knowledge is required and human interaction

becomes more important to stand out. While some skills are becoming increasingly important, others diminish in value (J1) *“To appoint a specific transcriber or scribe for group projects or meeting notes. That form of work, like writers and transcribers, has completely disappeared when it comes to skill sets”.* This plays in the literature that implies that humans engage in an ongoing race with workplace AI to acquire new skills that are intricate for AI to perform, the “symbiotic relationship” (Zirar et al., 2023). Meaning AI shifts the requirements of workers and they need to adapt to the new constant reality.

Managers understand that workers nowadays need to understand generative AI and how to work with it, it has become a hygiene factor. A Executive chairman of the board in (I1), *“Generative AI has had a huge impact on workers, you nowadays can’t employ workers who don't understand generative AI”*. Managers need to understand the new reality and teach employees how to use these tools, understanding the tools in itself are becoming a skill requirement. A CEO (C1) sounded off on this *"Just being familiar with ChatGPT and becoming comfortable and proficient with it, I believe, becomes a skill in itself. Something that is very valuable to know”*.

4.3 Generative AI Mitigating Startup Risk of Failure

4.3.1 Insufficient Funding Risk of Failure

A common thread among startups is the challenge of limited resources, but with the application of generative AI more could survive (Pattyn, 2023; Wasserman, 2012). It emerges from the interviews that funding becomes more flexible of an input to manage than before in several aspects of a software-centric startup. First and foremost, with the experienced productivity/efficiith AI and that while augmentation of human and AI will take place so will the full replacement in some aspects (Dell’Acqua et al., 2023; Bubeck et al., 2023; Noy and Zhang 2023; Berg et al., 2023; Girotra et al., 2023).

Secondly, it has been noted that the experienced productivity/efficiency advances will inherently lead to finding the product market fit faster, thus inherently leading to lower needed funds overall, making it cheaper to advance through the different stages of a startup and maturing into an established firm. A Growth Manager (G1) elaborates on this *"If you can reduce your development costs and development time, you can have a faster iteration loop*

and many more of those loops in a much shorter time. And then you will end up with a much better product than anyone else who does it in a more traditional way".

Furthermore, in terms of establishing a startup without outside investment, so called bootstrapping, it too has been affected with a Co-founder (M1) framing this effect as *"One can optimize the resources one has in a better way"*. In effect, empirics showcase that smaller teams are able to deliver further and faster than before, thus removing the need of outside of founding-team recruitment, effectively removing a large portion of why outside funds may be needed. You can also *"contribute more value on roughly the same runway"* according to CEO (L1), highlighting efficiency of generative AI usage. Moreover, with job roles being more flexible, it may also play into the need of outside funds as more diverse job roles are enabled to be performed by the founding team, removing the need for external recruitment and thus more funds.

Although, reflections as to the longevity of this effect have been questioned in empirics, as *"Looking two years ahead, the expectations from the investors will be aligned with what you can do with generative AI. Which means that you can only use this shift now"* states a growth Manager (G1) identifying it as an opportunistic one-time advantage to be utilized as outside financiers will adjust their expectations and thus their funding.

4.3.2 Altered Startup Team Building Approach

By implementing generative AI as a tool for team members it has been shown to lead to more flexible employees, and people can make an impact in more situations.
A Lead Developer (D1) observes a general cognitive shift in that *"Maybe we can hold off for six months until we hire our first product designer because we can do a lot with AI or, you know, our existing developers are 40, 50% more efficient if they use Copilot, for example"*.

A Co-founder (B1) breaks down the factors at play and how they may be affected in saying that *"again what I talked about regarding perspective density, you can collaborate, (...) there of course generative AI can help in both how we communicate, how we collaborate, how we learn especially"*.

The need for certain competence diminishes as a result of generative AI being available, for example, data management, analysis work, and repetitive work have been displaced with AI in the workplace (Chuang, 2021).
A Co-founder (E1) states that *"I definitely believe that it opens up for more individuals to venture into software-heavy startups. I firmly believe that it has paved the way for more, assuming that you have requirements, all the tools to learn new things, and experience, more individuals who can now execute."* adding that more teams may dare to pursue projects previously unfeasible.

A capital shift is a part of the current times with generative AI being a reality, a Co-founder (D1) continues saying *"A lot of these like industry specific things are sort of decreasing in value. And what's increasing in value is pragmatism, ability to problem solve"*. More people that are pragmatic but also more generalist as a Co-founder (H1) puts is *"Many of the people i've been working with for the past three years have been more generalist in many fields"*.
This is in line with research (Rampersad, 2020; Sousa and Wilks, 2018), whilst suggesting that workers are to benefit from developing "sustainable skills" such as critical thinking, problem-solving, communication, and teamwork to coexist harmoniously with intelligent systems, more soft skills.

4.3.3 Generative AI in Finding Product Market Fit

In accordance with previous studies and interviews, finding a product market fit is often the make or break it for startups.
A CEO (B1) finds that in terms of finding product market fit that generative AI can *"quickly write codes, quickly we can iterate, quickly we can learn, can affect our ability to find product market fit"*. AI has the potential to significantly mitigate the risk of product-market misalignment, a notable cause of startup failure (Pattyn, 2023; Wasserman, 2012).
Furthermore, a CEO (C1) agrees stating that *"Using generative AI for code is something I find very useful for getting the first version out into the market. Because one of the most important things for an early-stage startup is to obtain feedback from the market for revising and iterating on your product"*.

A Co-founder (J1) continues in explaining forces at play as *"And if you can reduce your development costs and development time, you can have a faster iteration loop and many more of those loops in a much shorter time (...), and as a startup, you have neither of those"*.

This is also in accordance with Sjödin et al., 2021, the use of generative AI, when automating tasks such as market analysis, insights and strategy development the company becomes fit to address market needs.

A CEO (C1) expresses that there is probably a higher chance that using generative AI will affect the cost of the development rather than the quality: *"I rather think perhaps that one releases a product faster and cheaper than building an app that is twice as good"*.

Table 2. Dimensions, Themes, Categories and Quotes

Second-Order Themes and First-Order Categories	Representative Quotes (see Appendix XX for secondary sources)
Overarching dimension: Software Development Advancements	
1. **Generative AI in Code Generation**	
Improved Code Generation Efficiency	A mix of those who use it somewhat as a sounding-board. Questions, answers, in their iterative process (...) generating code that they can then implement and test. (B1)
	With the value to be gained In Codegen, ChatGPT/generative AI can help speed up the work that developers do and that automatically proves more efficient. (D1)
	A one x-er can be basically be as skilled as a 10x-er. (E1)
	I think you could do more as a junior maybe if you have the tools helping you. (G2)
Code Translation	If you know which language it should be written in, then you can just say hello I want a function (...) then it just solves it. If it happens that you find code that works in Python but you need it in C++ then you say hey I have code in Python can you adjust it to C++ and it says yes here it is. (C1)
Time Saving	You can think more about how you structure it. (L1)
Product Operation Tool	We're using more generative AI as a product operations tool, trying to catch issues proactively and then give suggested actions to have what you can help. (D1)
AI as an Assistant	It works mostly as an assistant, almost. It can improve how the process gets started. (...) It can directly come with suggestions and different ways you can build it up or what gets started quickly and of course you avoid sitting there and writing code. (E1)
2. **Generative AI in Software maintenance**	

	Solution Suggestion	It's about getting those early ideas and suggestions for solutions, or what you can do is process a lot of code very thoroughly and specifically. Then try to pinpoint certain issues. (B1)
	Problem Identification	It's definitely an efficient way to handle errors and search for what could be wrong. (C1)
		When experiencing bottlenecks, using generative AI for debugging if you see that you can find things you wouldn't have found yourself as quickly. (J1)
	AI Automated Agents	Agents that collaborate and solve tasks that we want to get done. So if I have a page, I want to get all that information on these PMFs into data, then he (CTO), has an AI team with him, with different agents that essentially communicate with each other and solve this task. (E1)
		Create a user, a fake user with generative AI, and let that be the feedback point (...). You can use it as your user feedback on how this is experienced. (J1)
3.	**Iteration Cycles' Implications**	
	Shorter Sprints	It's a whole different mindset in how quickly you can perform these sprints. Typically, our sprints usually last maybe four weeks or something (...). But now I can start talking about a few days. Weekly sprints, like. Daily sprints. (J1)
		There will be those who see that you can do very much, very quickly, and ship at a very high level. I would say that the developers I work with, especially referring to my co-founder, (...), it feels like they do quality control more. (K1)
		Just there like how quickly we can write codes, quickly we can iterate, quickly we can learn, can affect our ability to find product market fit. (B1)
		Those who can get the most feedback from the market and build you into their product will have the best product they want and which will make you have a successful launch. It's like night and day. (J1)
		With generative AI you can reduce your development costs and development time, you can have a faster iteration loop and many more of those loops in a much shorter time. (M1)
	Task Prioritization	It's about understanding, hey, we have all of these feature requests in the backlog. We have all of these bug reports. Is there any way we can structure it so we actually utilize the most of our developers for the upcoming sprint or the upcoming roadmap? I think there at AI is just really, really good at understanding sort of, hey, given that they have these five tasks, does this align with anything on our roadmap? Does this align with anything on our business objectives? (...) But I think it comes down to prioritization

Overarching dimension: Human Resource Shifts

4.	**Team Dynamics Shifts**	
	AI in Team Communication	The possibility for AI to help us communicate better, feel more secure, actually gather data on things that we might miss when we're talking but capture these aspects and help us optimize our perspective. That's what we need. (B1)
		Developers don't like being in meetings, they don't like answering messages. So that's just the positive thing in that developers can do more within the context because a lot of the communication can be reduced. (D1)
		So I would say that the collaboration between tech and non-tech individuals can potentially improve (...). We aim to make a somewhat automatic translation of something complicated into something simple for those who need to handle it. (K1)
	Employee Onboarding	Instead of spending a lot of time writing documentation and manual onboarding documents, you could just give them this AI tool. (G2)
5.	**Job Role Flexibility**	
	Continuous Learning	The collaboration between tech and non-tech individuals can at least potentially improve. And a tech person can also be more involved." as the AI works as a bridge, making people understand each other. (K1)
		You become more flexible in what you can work with (role) if you can use ChatGPT. (C1)
	Upskilling	There are possibilities due to generative AI to jump between different departments and roles with the help of the functions at hand. (G1)
		I made mockups for platform development, which meant I didn't have to hire a designer and a coder because I could just do it super simply. (H1)
6.	**Altered Human Capital Requirements**	
	Coding Skills Less Important	I think we're going to see a trend of startups being comprised more of generalists at an early stage and less dependency on hiring competence. (D1)

		This technology allows companies to defer hiring specialists, thereby increasing efficiency and reducing overhead costs. (E1)
	Prompt Engineering an Emerging Skill	One x-er can become equally capable as an 10x-er. (E1)
		Generative AI has had a huge impact on workers, you nowadays can't employ workers who doesn't understand generative AI (....). A higher level of social skills and empathy is now required from the employee, soft skills is more sought after. (I1)
	AI Replacing Humans	Just being familiar with ChatGPT and becoming comfortable and proficient with it, I believe, becomes a skill in itself. Something that is very valuable to know. (C1)
		To appoint a specific transcriber or scribe for group projects or meeting notes. That form of work like writers and transcribers, it has completely disappeared when it comes to skill sets. (J1)

Overarching dimension: Startup Risk of Failure Market implications of generative AI

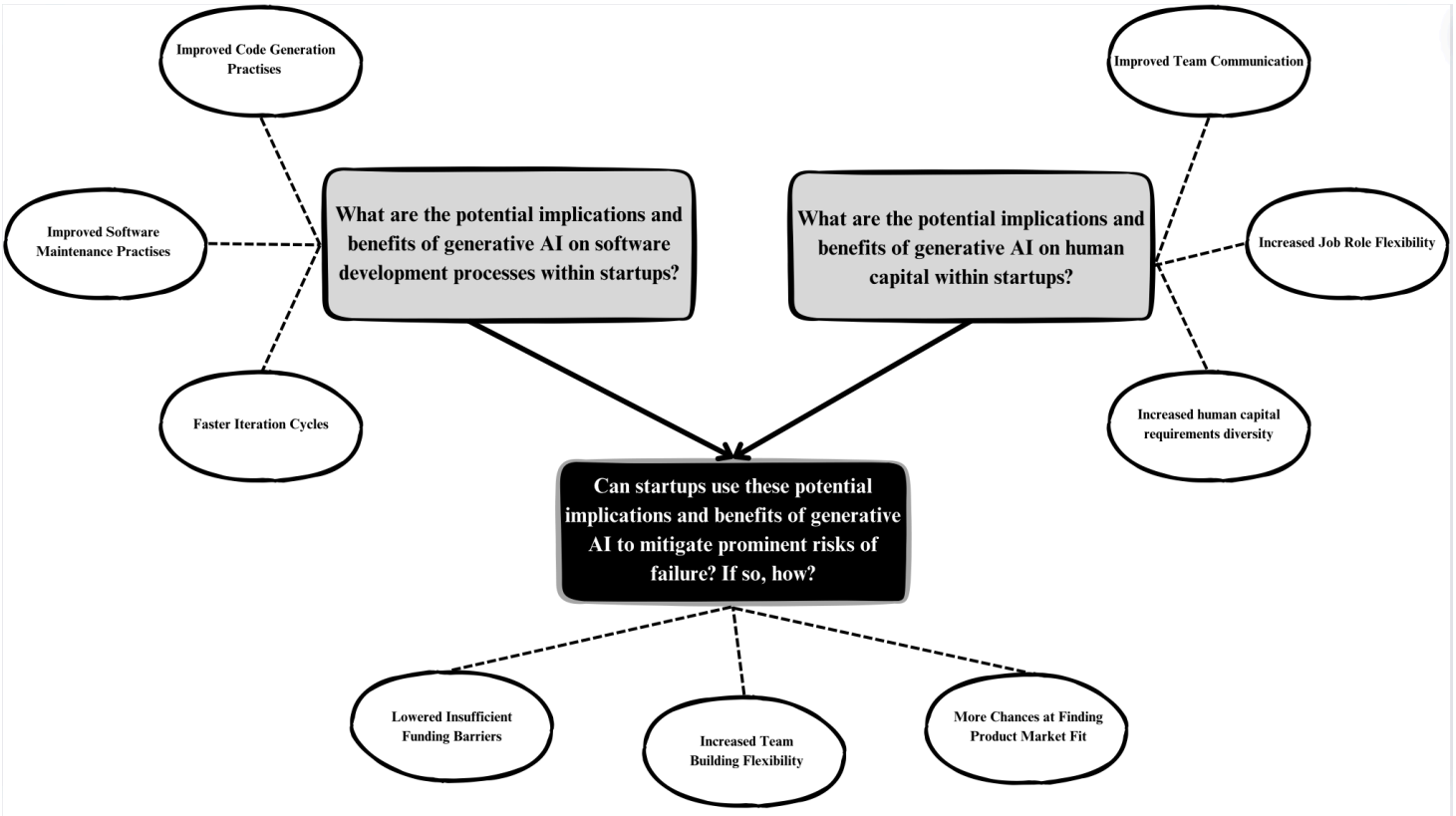
7.	**Insufficient funding risk of failure**	
	Financial Resource Saving	If you save time, you save money, of course, because then you either need fewer employees or, in total, in a shorter period of time. So, it's about saving money too. Even though these kinds of solutions that you can buy into aren't free, they are much cheaper than hiring a software team, of course. (C1)
		If you can reduce your development costs and development time, you can have a faster iteration loop and many more of those loops in a much shorter time. And then you will end up with a much better product than anyone else who does it in a more traditional way. (G1)
		Yes, (...) I created mockups for platform development and then I didn't need to bring in a designer and a coder because I could just do it super easily. (H1)
		But the idea is that you can contribute more value on roughly the same runway. That you can still achieve more. (L1)
	Resource Optimization	Looking two years ahead, the expectations from the investors will be aligned with what you can do with generative AI. Which means that this shift you can only use now. (G1)
		One can optimize the resources one has in a better way. (M1)

8.	**Altered startup team building approach**	
	Lowered Technical Skills Barriers	I definitely believe that it opens up for more individuals to venture into software-heavy startups. I firmly believe that it has paved the way for more, assuming that you have requirements, all the tools to learn new things, and experience, more individuals who can now execute. (E1)
		Again what I talked about regarding perspective density, you can collaborate, (...) there of course generative AI can help in both how we communicate, how we collaborate, how we learn especially. (B1)
	Generalist Human Capital Shift	A lot of these like industry specific things are sort of decreasing in value. And what's increasing in value is like pragmatism, ability to problem solve. (D1)
		Many of the people i've been working with for the past three years have been more generalist in many fields (H1)
	Team building flexibility	Maybe we can hold off for six months until we hire our first product designer because we can do a lot with AI or, you know, our existing developers are 40, 50% more efficient if they use Copilot, for example. (D1)
9.	**Generative AI in finding product market fit**	
	Faster Iteration Loops	Quickly write codes, quickly we can iterate, quickly we can learn, can affect our ability to find product market fit. (B1)
		Using generative AI for code is something I find very useful for getting the first version out into the market. Because one of the most important things for an early-stage startup is to obtain feedback from the market for revising and iterating on your product. (C1)
	Increased Number of Loops	You can afford more tests if each test is completed faster, of course. So I would say, in two out of three cases, you gain a small advantage. (C1)
		And if you can reduce your development costs and development time, you can have a faster iteration loop and many more of those loops in a much shorter time. (...), and as a startup, you have neither of those. (J1)
	Increased Iteration Quality or Speed Tradeoff	I believe there will be two camps here. (...) There will be those who see that one can do a lot, very quickly, and who ship at a very high level. (K1)
		I rather think perhaps that one releases a product faster and cheaper than building an app that is twice as good because I think it's difficult to say. (C1)

5. Discussion

Themes discussed in affecting the primary research objectives of generative AI benefits in software development processes and human capital are found to be interlinked to the secondary research objective of generative AI mitigating risk of failure. As such, the discussion has been structured in such a manner that accommodates for this and the following visualization of the discussion's structure is provided for the reader for better understanding:

Figure 2. Discussion structure visualization



5.1 What are the potential implications and benefits of generative AI on software development processes within startups?

5.1.1 Improved Code Generation Practises

Our findings indicate that the emergence of generative AI tools has, through various use cases within code generation, directly led to improved code generation practices. From the interviews, it can be concluded that software-centric startups are experiencing an increase in

productivity in code generation as a result of generative AI usage. This is in line with literature which collectively highlights LLMs capability to enhance individual productivity through creative outputs and performance improvements in tasks historically considered difficult to automate, such as writing and programming (Dell'Acqua et al., 2023; Bubeck et al., 2023; Noy and Zhang 2023; Berg et al., 2023; Girotra et al., 2023).

Furthermore, the interview data highlights that this process enhances rather than completely automates an individual's work, as it requires human developer oversight to ensure that AI outputs align with human intentions. This finding is in agreement with research indicating that AI's role can vary, either substituting for or complementing human labor, depending on the specific context and implementation (Acemoglu and Restrepo, 2019).
One of the prominent roles of generative AI in code generation is described by respondents as acting as an assistant where code generation productivity improvements are pursued through building initial code templates or initial coding inspiration. Respondents' quotes indicate that the direct effect is not the replacement of software developer hours with AI but rather the augmentation of human work.

Lastly, the direct benefit of generative AI usage noted by study participants is its applicability code translation within code generation. Assumption can be made that this removes the need for, at time, double the work and additional deep knowledge of multiple coding languages needed for various software platform deployment.

To give a concise outline, the results of this study show that code generation as one of core software development practices has been greatly altered. The main benefits reaped in code generation from startups are time saving through generative AI augmenting code generation work and decreasing needed software developer hours.

5.1.2 Improved Software Maintenance Practises

This study shows that software maintenance practices have through similar nature as code generation been improved. However, respondents note the specific nature of deploying generative AI in software maintenance is more automated and less augmented. A direct findings takeaway is that problem identification is the pillar of generative AI usage within software maintenance for software startups. The premise being that these are situations where it is impossible for the human eye to identify software problems as fast as generative AI in

prominent cases such as debugging. Furthemore, pre-generative AI these tasks were very time consuming when translated to developer hours while being least productive as they often were highly ambiguous in their nature as noted by respondents. Generative AI has been revealed in this study to lift that veil of problem seeking ambiguity where a direct assumption is that generative AI ensures that software developer hours are spent on more straightforward tasks, ultimately leading to higher degree of productivity when developing software.

Continuing, solution suggestion noted by respondents is an additional use-case, in which generative AI serves as a brainstorming partner for finding the best fix depending on the situation at hand while offering several alternatives. As such, findings show that coming up with a solution to a problem has improved as software engineers rely on generative AI tools for solution alternatives which can as well be automatically applied to the problem upon choice. In that sense, respondents note the increase in ease of problem handling due to generative AI.

Lastly, findings show that software centric startups have turned to generative AI for a higher degree of AI automated work through development and deployment of automated software maintenance AI agents. Notably, once deployed, such agents remove the human factor from software maintenance in most common software failures. This finding correlates to be true in an unresearched startup environment with previous research showing proof of AI fully replacing human tasks (Eloundou et al., 2023; Noy and Zhang, 2023).

5.1.3 Iteration Cycles Have Become Faster

Iteration cycles have been discussed as a merging point in regards to generative AI implications on software development practices. In that regard, the study's insights witness a change in mindset within software development sprints. Study's participants feel that, as part of software development, project management has indirectly been affected in relation to planning the work to be done and reviewing the work that has been done. It is here that participants note improvement specifically in development sprints from generative AI as a product operations tool, essentially prioritizing different tasks and minimizing sprint bottlenecks. Upon discussing the build-measure-learn loop, the respondents noted the difference that inherently, iteration loops become speedier as a result of generative AI usage, prompting an even higher degree of reiterative software development. An assumption to be made here is that the number of loops increases, increasing the focus on quality and test user

data collection for the loop to start anew.

Furthermore, the perceived improvements essentially open up new avenues within iteration cycles with respondents pointing to the amount of work done and others referring to quality in software code infrastructure to prevent future need of work refinement. A premise to be made here is that early stage software startups are faced with trade offs when planning for future reiteration cycles.

Nevertheless, the results of this study show that no matter the balance in the tradeoff, the biggest shift in reiteration cycles coupled to product development is task prioritization. Assuming that by using generative AI as a product operations tool, time saving is considerable. Supported by literature (Dell'Acqua et al., 2023), this study's findings clearly show LLMs ability to understand text and filter content excels at suggesting startup iteration cycle execution planning.

5.2 What are the potential implications and benefits of generative AI on human capital within startups?

5.2.1 Team dynamics

The interviews essentially reveal a major implication from generative AI with regards to team dynamics to be altered communication between team members, as generative AI has made communication easier and more efficient for a number of different actors across startup organizations.

One respondent revealed that the implementation of generative AI has made communication between coders and non-coders easier at the organization since an AI can be used for check-in-progress. This means that programmers can focus more on their main tasks, and from the manager's perspective it also makes it easier for them to plan for delivery since more frequent updates can be given.

Another way that communication is improving is with the development of generative AI tools that translate a technical, for example coding, issue into a non technical explanation. As described by a respondent, tools like this are being developed to strengthen the understanding between departments and make for a seamless cooperation way of work.

5.2.2 Job role flexibility

Generative AI has had major implications in the way employees conduct themself with regards to job roles in startups. People are becoming more flexible, meaning that they can take on multiple job roles within a startup, this has been evident from what respondents stated.

People with a broad knowledge level paired with a sense of soft skills are set to see a bright future within the startup world. Respondents have ousted support to for example management consultants being a great example, equipped with generative AI this person is likely to perform well in multiple departments. Generative AI gives the employee the tools to be deep, in terms of knowledge, and therefore being able to be a competent employee in multiple work task situations (Chuang, 2021). The implications of this is that startups, that often lack strong financial backing, can hire less people due to the existing ones being able to perform in multiple job roles. Focusing on soft skills and ambition will play into the much important issue to get the right team together. Having the right people that share the same ambition is crucial for early stage teams but also potential investors. It's therefore better if the company shifts from recruiting based on quantitative knowledge and more on ambition, since now with generative AI, highly motivated people can do more (Peng et al., 2023).

5.2.3 Increased human capital requirements diversity

The study’s findings shows that capital requirements have shifted since the introduction of generative AI in the startup world. Respondents have expressed that generative AI has made it possible to rely less on industry specific skills in an early stage venture, and previous barriers regarding technical skills have been torn down due to the introduction of generative AI.

Study participants together with literature (Zirar et al., 2023) have made it clear that generative AI has shifted the requirements of workers and new hygiene factors have been implemented. Findings show that knowledge on generative AI is not only seen as a skill but also necessary as prompt engineering is seen as an emerging and valuable new skill. Routine tasks can be outsourced using tools based on generative AI which lead to more efficient work, better quality control and more focus on communication to customers. In practice this means that junior positions may be in jeopardy since generative AI can do many kinds of

tasks by itself, but on the other hand respondents expressed that it can also boost employees' capabilities. In a context of early venture startups, generative AI will likely have implications closer to the latter, since startups will seek to gain financially if they can equip junior employees with capable tools.

Startups now need to equip their employees with the knowledge needed to interpret prompts but also seek for other qualities in an employee rather than technical skill. In addition, respondents noted that social skills are now required, soft skills are becoming more sought after, generative AI is used to free up time and give startups more room to use its resources towards its core mission. Human interactions and real relationships are increasing in value when much of their work can be automated. This leads to another angle, namely startups are now starting to hire generalists at an early stage with less need for technical competence. Generalists are employees that, rather than being experts in one field, can move across multiple ones based on their wide set of knowledge and strong social skills. This plays into job role flexibility, where we see that with the help of generative AI, employees are more flexible in their job roles within a startup due to increased ability for continuous learning.

5.3 Can startups use these potential implications and benefits of generative AI to mitigate prominent risks of failure? If so, how?

5.3.1 Lowered Insufficient Funding Barriers

As discussed in literature, insufficient funding is one of the prime reasons why startups may fail (Giardino et al., 2015). This study’s results reveal that with the experienced software development practices, improvements in efficiency and thus productivity as well as human capital shift are observed. The major common implication of generative AI on funding needs is that saving time is saving money. With that said, an assumption is that on one side the benefits of generative AI, is that startup companies can experience a revolution in flexibility of meeting business challenges financially. One such area is the ability to choose to upskill or reskill current employees rather than employing a new designated team. As such, the study postulates that generative AI has unlocked new areas of financial flexibility for studied companies, by enabling founders to address capital intensive needs in the early stages of a startup such as additional human capital.

Findings provide proof of this observation as smaller teams are thought to be as efficient as larger teams in the past pre-generative AI in addition to findings revealing new areas of

automated generative AI agents deployment which have a direct financial replacement benefit through human to AI augmented work. As discussed during the interviews, with higher human capital efficiency as a result of generative AI usage, flexibility and AI human replacement iteration loops have become ever so faster. In effect, we assume that generative AI has enabled movement of cash flows forward in time and need of funds to later stages of the startup journey. It is suggested by study participants that as faster product releases are achieved with generative AI it leads to revenue generation in a shorter period of time. Last but not least, as noted from the respondents and their organizations, the risk of failure due to insufficient funding has altered already established funds runways. Teams are experiencing a sense of being able to achieve more with less, thus goals have been set higher for what can be achieved with current funds.

In summary, early stage software startups are experiencing a higher flexibility in financial resource deployment and financial resource savings across already made plans and a new aspect for financial resource optimization has emerged in order to deliver most development value in a competitive manner.

5.3.2 Increased Team Building Flexibility

A key aspect of reducing the risk of failure in a startup environment is to build a good team (Giardino et al., 2015), and with generative AI respondents feel that this is getting easier, with the technology facilitating flexibility. In line with this, respondents expressed that generative AI helps with communication, collaboration and how learning is facilitated within the company as well as what competence is needed. Supported by literature, an assumption to be made is that the need for certain competence diminishes with the introduction of generative AI in startups, as repetitive work has been displaced and apid skill learning enablements, employees are now using generative AI to work across multiple job roles of a startup (Chuang, 2021). Further assumed implications is that this will lead to startup companies not needing to employ skills specialists to the same extent, as all employees will to a certain extent be able to work across departments. Inherently, this will lead to more projects being pursued as less resources are needed and the knowledge foundation within a team is safer, with skills barriers of entry noted by participants being lower. This ability to solve problems is what's increasing in value when leaders look to employ new team members, as the technical barriers are lowered due to generative AI (Rampersad, 2020; Sousa and Wilks,

2018). Pragmatic people and generalists is what startup companies will benefit from when hiring.

5.3.3 More Chances at Finding Product Market Fit

Findings indicate that finding product market fit is deemed to not have been made easier directly, however this study shows a few indications of how odds of finding product market fit have been increased.

Within the context of software startups, empirics suggest that with the emergence of generative AI, startups may get more opportunities at finding product market fit than observed before or alternatively getting to that point in a shorter period of time.
This is made clear as understandably so, with improved productivity and an increased flexibility in both financial resources and human capital, adjusting to market needs has been made easier for a well run software centric startup. Whatmore, the build-measure-learn loop has been deemed by respondents to be directly affected across the whole value producing chain. As building is faster than before, measuring is made more clear with more product updates gathering user feedback and last but not least learning from more up-to-date user data points as development loops are more frequent.

Lastly, with the emergence of generative AI, agents have come to be deployed that may act as a test user which is more dynamic in providing feedback and in effect to some extent replacing the need for human user feedback between reiteration cycles. This in effect, further improves the speed of reiteration cycles as obvious pitfalls are avoided before major software updates launch, all while development prioritization is made more clear.

6. Conclusion

This research paper sought to explore generative AIs implications for software development startups. The research question asked were, firstly, what kind of implications does generative AI have on software development processes within startups. The implications were that generative AI had a great impact on how startups conducted their code generation practices, startups are to a wider extent using generative AI as a meaningful tool for developers to

program code using prompting. It has also shown to improve software maintenance practices and startups now use generative AI to quality check more efficiently and find better solutions to problems. The iteration cycles have also become faster, using generative AI as a task prioritizer, the loops are shorter and the number of loops increases.

Secondly, what are the implications of generative AI on human capital within startups. The implications were that we see better dynamics within startups teams due to the introduction of generative AI, in terms of communication but also team building. We can also see that the job role flexibility is increasing because employees now have the tools to shift roles, meaning one can make an impact in multiple departments. Human capital requirements have also shifted. We can see a shift towards generalists within startups due to the fact that industry specific skills can be outsourced to a generative AI tool and it is increasingly becoming important that employees have soft skills.

Lastly, if the use of generative AI helps startups mitigate the most prominent early-stage startup risks of failure. The collective experiences of startups and insufficient funds is indicative of such a fact due to generative AI helping to lower various costs while streamlining production through greater labor productivity. In addition, generative AI enables teams with less experience and deep area knowledge to get started along the early-stage startup journey. Co-founders in the process of building a team as proficiency in generative AI usage may complete co-founder skills profiles who previously were not eligible for team addition consideration. Finally, generative AI is deemed to not directly lead to lower risk of failure due to unfound product market fit, instead it can increase the odds of achieving product-market fit for startup teams that use the technology to generate more iteration cycles.

6.1 Managerial Implications

The results of our research underpin key recommendations for management in the early stage software startup industry. We propose the following points to be considered when outlining an early stage software development startup strategy in a post generative AI world:

1. Agreeing on an initial way of working will need to incorporate generative AI discussion as to the level of augmentation and automation to be allowed for in various software development processes.
2. When building a team, co-founders seeking co-founders will need to outline generative AI criteria for specific positions as the rewards of understanding generative AI are immense.
3. When employing people, software centric startups are through the results of this study encouraged to think outside the box, not specifically focusing on the technical skills of each team member but rather ensuring needed human and AI values are also present on a team level, such as a will to learn and soft skills.
4. Managers are encouraged to develop ad-hoc generative AI strategies for upskilling and reskilling the workforce during the early stage where team members are prone to job flexibility due to job role ambiguity and dynamic business needs.
5. When calculating financial metrics, generative AI usage and its rewards will need to be incorporated into revenue generation and cash flow planning for attracting investors.
6. Considering human to AI augmentation in team building offers heightened sense of flexibility, expanding the potential candidate sample space thus offering early stage startup managers an alternative way of building a team through AI utilization.
7. In terms of finding product market fit, leveraging generative AI for early reiterations and constant development through faster and more up-to-date early user feedback may prove to be the biggest takeaway managerial focus area of the study. Release more builds in a shorter time span, focus on measuring early user data and finally learn from that data and prioritize development.

6.2 Theoretical Contribution

This paper contributes to comprehending how early-stage software startups have adapted generative AI to software development processes, investigating the various use-cases and perceived rewards. Additionally, human capital shifts are also researched as the other side of the coin in AI business literature as human to AI ratios in workforce and level of automation as well as augmentation in software startups is investigated. By probing into software centric startups and early-stage startups in general, our research differentiates itself and adds to the much needed and relevant research on the post generative AI technology world. We add a

much needed layer of consideration for the most frequent business practices within an early stage software startup. More specifically, role of generative AI in software development practices, building a team, financial metrics planning and the build-measure-learn cycles are added to the model's four managerial advice dimensions. In doing so, we quench the academic thirst outlined in the research gap through merging research agenda fields and creating an intersection of where research questions meet which is examining implications of generative AI on early stage software startups.

6.3 Limitations and Further Research

The study was limited to understanding experiences and general feelings from early usage of generative AI technology within early-stage software startups. As such it only stretches to the business experts, managers or team-leaders of researched startup labor groups. The study provides groundwork for further research seeking to quantify implications of generative AI on early stage software startups within the two main fields of theoretical contribution which are startup software development processes efficiency increase and ability to assume a higher degree of job role flexibility due to the emergence of generative AI. Moreover, this should be investigated quantitatively focusing solely on employees, disincluding managerial roles. Furthermore, in the context of generative AI our research could have investigated an additional layer of willingness to adopt generative AI before results generalization assuming an equal level thereof pre-hand.

In order to achieve a higher degree of comprehension of implications of generative AI on early stage software startups, a challenging aspect investigating potential risks or challenges could have been pursued. In effect, this would possibly have provided another side to the coin of potential drawbacks in certain business practice adoptions of generative AI or further risk factors rather than only focusing on the experienced rewards.

Lastly, it would have been of interest to separate generative AI into service specific technologies (such as Copilot) and more generalist model usage (such as GPT) as it had come up during the interviews, there are certain preferences in the choice of model and perceived performance. Thus it would be interesting to research further generative AI tool market implications on which delivers most value to enterprise use cases versus private consumer use cases.

7. Reference list

1. Agarwal, N., Moehring, A., Rajpurkar, P., & Salz, T. (2023). *Combining Human Expertise with Artificial Intelligence: Experimental Evidence from Radiology*. https://doi.org/10.3386/w31422
2. Andersen, Ib. (1998). *Den Uppenbara Verkligheten*. Lund: Studentlitteratur.
3. Autor, D. H., Levy, F., & Murnane, R. J. (2003). The Skill Content of Recent Technological Change: An Empirical Exploration. *The Quarterly Journal of Economics*, *118*(4), 1279–1333. https://doi.org/10.1162/003355303322552801
4. Ahrne, Göran and Peter Svensson. (2011). *Handbok I Kvalitativa Metoder*. Malmö: Liber AB, 2011. Print.
5. Acemoglu, D., & Restrepo, P. (2019). Automation and New Tasks: How Technology Displaces and Reinstates Labor. *Journal of Economic Perspectives*, *33*(2), 3–30. https://doi.org/10.1257/jep.33.2.3
6. Allen, R., & Choudhury, P. (Raj). (2022). Algorithm-Augmented Work and Domain Experience: The Countervailing Forces of Ability and Aversion. *Organization Science*, *33*(1), 149–169. https://doi.org/10.1287/orsc.2021.1554
7. Amabile, T. (2020). GUIDEPOST: Creativity, Artificial Intelligence, and a World of Surprises Guidepost Letter for Academy of Management Discoveries. *Academy of Management Discoveries*, amd.2019.0075. https://doi.org/10.5465/amd.2019.0075
8. Anthony, C., Bechky, B. A., & Fayard, A.-L. (2023). "Collaborating" with AI: Taking a System View to Explore the Future of Work. *Organization Science*, *34*(5), 1672–1694. https://doi.org/10.1287/orsc.2022.1651
9. Autor, D. H. (2015). Why Are There Still So Many Jobs? The History and Future of Workplace Automation. *Journal of Economic Perspectives*, *29*(3), 3–30. https://doi.org/10.1257/jep.29.3.3
10. Autor, D. H., & Dorn, D. (2013). The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market. *American Economic Review*, *103*(5), 1553–1597. https://doi.org/10.1257/aer.103.5.1553
11. Bailey, D. E., Faraj, S., Hinds, P. J., Leonardi, P. M., & von Krogh, G. (2022). We Are All Theorists of Technology Now: A Relational Perspective on Emerging Technology and Organizing. *Organization Science*, *33*(1), 1–18. https://doi.org/10.1287/orsc.2021.1562
12. Barrett, M., Oborn, E., Orlikowski, W. J., & Yates, J. (2012). Reconfiguring Boundary Relations: Robotic Innovations in Pharmacy Work. *Organization Science*, *23*(5), 1448–1466. https://doi.org/10.1287/orsc.1100.0639
13. Bavaresco, R., Silveira, D., Reis, E., Barbosa, J., Righi, R., Costa, C., Antunes, R., Gomes, M., Gatti, C., Vanzin, M., Junior, S. C., Silva, E., & Moreira, C. (2020). Conversational agents in business: A systematic literature review and future research directions. *Computer Science Review*, *36*, 100239. https://doi.org/10.1016/j.cosrev.2020.100239
14. Beane, M. I., & Leonardi, P. M. (2022). Pace Layering as a Metaphor for Organizing in the Age of Intelligent Technologies: Considering the Future of Work by Theorizing the Future of Organizing. *Journal of Management Studies*. https://doi.org/10.1111/joms.12867
15. Berg, J. M., Raj, M., & Seamans, R. (2023). Capturing Value from Artificial Intelligence. *Academy of Management Discoveries*, *9*(4), 424–428. https://doi.org/10.5465/amd.2023.0106

16. Berg, V., Birkeland, J., Nguyen-Duc, A., Pappas, I. O., & Jaccheri, L. (2018). Software startup engineering: A systematic mapping study. *Journal of Systems and Software*, *144*, 255–274. https://doi.org/10.1016/j.jss.2018.06.043
17. Blank, S. (2013). Why the Lean Start-up Changes Everything. HBR. https://hbr.org/2013/05/why-the-lean-start-up-changes-everything
18. Boussioux, L., N. Lane, J., Zhang, M., Jacimovic, V., & Lakhani, K. R. (2023). The Crowdless Future? How Generative AI Is Shaping the Future of Human Crowdsourcing. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4533642
19. Boustan, L. P., Choi, J., & Clingingsmith, D. (2022). *Automation After the Assembly Line: Computerized Machine Tools, Employment and Productivity in the United States*. https://doi.org/10.3386/w30400
20. Bell, E., Bryman, A., & Harley, B. (2022). Business Research Methods (6th ed.). Oxford University Press.
21. Brynjolfsson, E., Li, D., & Raymond, L. (2023). *Generative AI at Work*. https://doi.org/10.3386/w31161
22. Bubeck, S., Chandrasekaran, V., Eldan, R., Gehrke, J., Horvitz, E., Kamar, E., Lee, P., Lee, Y. T., Li, Y., Lundberg, S., Nori, H., Palangi, H., Ribeiro, M. T., & Zhang, Y. (2023). *Sparks of Artificial General Intelligence: Early experiments with GPT-4*. https://doi.org/10.48550/arXiv.2303.12712
23. Chalmers, D., MacKenzie, N. G., & Carter, S. (2020). Artificial Intelligence and Entrepreneurship: Implications for Venture Creation in the Fourth Industrial Revolution. *Entrepreneurship Theory and Practice*, *45*(5), 1028–1053. https://doi.org/10.1177/1042258720934581
24. Choi, J. H., & Schwarcz, D. B. (2023). AI Assistance in Legal Analysis: An Empirical Study. *SSRN Electronic Jour*nal. https://doi.org/10.2139/ssrn.4539836
25. Chowdhury, S., Dey, P., Joel-Edgar, S., Bhattacharya, S., Rodriguez-Espindola, O., Abadie, A., & Truong, L. (2022). Unlocking the value of artificial intelligence in human resource management through AI capability framework. *Human Resource Management Review*, *33*(1), 100899. https://doi.org/10.1016/j.hrmr.2022.100899
26. Chuang, S. (2021). An empirical study of displaceable job skills in the age of robots. *European Journal of Training and Development*, *45*(6/7), 617–632. https://doi.org/10.1108/EJTD-10-2019-0183
27. Cosenz, F., & Bivona, E. (2020). Fostering growth patterns of SMEs through business model innovation. A tailored dynamic business modelling approach. *Journal of Business Research*, *130*, 658–669. https://doi.org/10.1016/j.jbusres.2020.03.003
28. Crowne, M. (2002). Why software product startups fail and what to do about it. Evolution of software product development in startup companies. *IEEE International Engineering Management Conference*, 338–343. https://doi.org/10.1109/IEMC.2002.1038454
29. Dell'Acqua, F., McFowland, E., Mollick, E. R., Lifshitz-Assaf, H., Kellogg, K., Rajendran, S., Krayer, L., Candelon, F., & Lakhani, K. R. (2023). Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4573321

30. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., … Williams, M. D. (2019). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002
31. Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Information Systems Frontiers*, *21*(3), 719–734. https://doi.org/10.1007/s10796-017-9774-y
32. Eloundou, T., Manning, S., Mishkin, P., & Rock, D. (2023). *GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models*. https://doi.org/10.48550/arXiv.2303.10130
33. Faraj, S., & Leonardi, P. M. (2022). Strategic organization in the digital age: Rethinking the concept of technology. *Strategic Organization*, *20*(4), 771–785. https://doi.org/10.1177/14761270221130253
34. Felten, E. W., Raj, M., & Seamans, R. (2023). Occupational Heterogeneity in Exposure to Generative AI. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4414065
35. Feuerriegel, S., Shrestha, Y. R., von Krogh, G., & Zhang, C. (2022). Bringing artificial intelligence to business management. *Nature Machine Intelligence*, *4*(7), 611–613. https://doi.org/10.1038/s42256-022-00512-5
36. Flick, U. (2015) *Introducing Research Methodology: A Beginner's Guide to Doing a Research Project.* SAGE Publications.
37. Furman, J., & Seamans, R. (2019). AI and the Economy. *Innovation Policy and the Economy*, *19*, 161–191. https://doi.org/10.1086/699936
38. Geerling, W., Mateer, G. D., Wooten, J., & Damodaran, N. (2023). ChatGPT has Aced the Test of Understanding in College Economics: Now What? *The American Economist*, *68*(2), 233–245. https://doi.org/10.1177/05694345231169654
39. Giardino, C., Bajwa, S. S., Wang, X., & Abrahamsson, P. (2015). *Key Challenges in Early-Stage Software Startups* (pp. 52–63). https://doi.org/10.1007/978-3-319-18612-2_5
40. Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking Qualitative Rigor in Inductive Research. *Organizational Research Methods*, *16*(1), 15–31. https://doi.org/10.1177/1094428112452151
41. Girotra, K., Meincke, L., Terwiesch, C., & Ulrich, K. T. (2023). Ideas are Dimes a Dozen: Large Language Models for Idea Generation in Innovation. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4526071
42. Giuggioli, G., & Pellegrini, M. M. (2022). Artificial intelligence as an enabler for entrepreneurs: a systematic literature review and an agenda for future research. *International Journal of Entrepreneurial Behavior & Research*, *29*(4), 816–837. https://doi.org/10.1108/IJEBR-05-2021-0426
43. Zirar, A., Ali, S. I., & Islam, N. (2023). Worker and workplace Artificial Intelligence (AI) coexistence: Emerging themes and research agenda. *Technovation*, *124*, 102747. https://doi.org/10.1016/j.technovation.2023.102747

44. Gkinko, L., & Elbanna, A. (2023). The appropriation of conversational AI in the workplace: A taxonomy of AI chatbot users. *International Journal of Information Management*, *69*, 102568. https://doi.org/10.1016/j.ijinfomgt.2022.102568
45. Goldin, C., & Katz, L. (1996). *The Origins of Technology-Skill Complementarity*. https://doi.org/10.3386/w5657
46. Haefner, N., Wincent, J., Parida, V., & Gassmann, O. (2020). Artificial intelligence and innovation management: A review, framework, and research agenda✰. *Technological Forecasting and Social Change*, *162*, 120392. https://doi.org/10.1016/j.techfore.2020.120392
47. Haksever, C. (1996). Total Quality Management in the small business environment. *Business Horizons*, *39*(2), 33–40. https://doi.org/10.1016/S0007-6813(96)90021-X
48. Wilson, J & Daugherty, P. (2018). Collaborative Intelligence: Humans and AI Are Joining Forces. HBR https://hbr.org/2018/07/collaborative-intelligence-humans-and-ai-are-joining-forces
49. Wilson, J, Daugherty, P & Davenport, C. (2019). The Future of AI Will Be About Less Data, Not More. HBR. https://hbr.org/2019/01/the-future-of-ai-will-be-about-less-data-not-more
50. Kanazawa, K., Kawaguchi, D., Shigeoka, H., & Watanabe, Y. (2022). *AI, Skill, and Productivity: The Case of Taxi Drivers*. https://doi.org/10.3386/w30612
51. Kenton, W. (2024). What Is Productivity and How to Measure It. Investopedia. https://www.investopedia.com/terms/p/productivity.asp (Retrieved 4/3 2024)
52. Kittur, A., Yu, L., Hope, T., Chan, J., Lifshitz-Assaf, H., Gilon, K., Ng, F., Kraut, R. E., & Shahaf, D. (2019). Scaling up analogical innovation with crowds and AI. *Proceedings of the National Academy of Sciences*, *116*(6), 1870–1877. https://doi.org/10.1073/pnas.1807185116
53. Kung, T. H., Cheatham, M., Medenilla, A., Sillos, C., de Leon, L., Elepaño, C., Madriaga, M., Aggabao, R., Diaz-Candido, G., Maningo, J., & Tseng, V. (2023). Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. *PLOS Digital Health*, *2*(2), e0000198. https://doi.org/10.1371/journal.pdig.0000198
54. Hu, K. (2023). ChatGPT sets record for fastest-growing user base - analyst note. Reuters https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/ (Retrieved 4/3 2024)
55. Laitinen, J. A., & Senoo, D. (2019). Knowledge Sharing in Young Startups—First Quantitative Steps. *Journal of Service Science and Management*, *12*(04), 495–520. https://doi.org/10.4236/jssm.2019.124034
56. Kumar,L S. P. (2017). State of The Art-Intense Review on Artificial Intelligence Systems Application in Process Planning and Manufacturing. *Engineering Applications of Artificial Intelligence*, *65*, 294–329. https://doi.org/10.1016/j.engappai.2017.08.005
57. Liberman-Yaconi, L., Hooper, T., & Hutchings, K. (2010). Toward a Model of Understanding Strategic Decision-Making in Micro-Firms: Exploring the Australian Information Technology Sector. *Journal of Small Business Management*, *48*(1), 70–95. https://doi.org/10.1111/j.1540-627X.2009.00287.x
58. Magnani, G., & Gioia, D. (2023). Using the Gioia Methodology in international business and entrepreneurship research. *International Business Review*, *32*(2), 102097. https://doi.org/10.1016/j.ibusrev.2022.102097

59. Matt, D. T., & Rauch, E. (2013). Implementation of Lean Production in Small Sized Enterprises. *Procedia CIRP*, *12*, 420–425. https://doi.org/10.1016/j.procir.2013.09.072
60. Iansiti, M & Lakhani, K (2020). Competing in the age of AI. HBR https://hbr.org/2020/01/competing-in-the-age-of-ai
61. Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, *381*(6654), 187–192. https://doi.org/10.1126/science.adh2586
62. Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., & Abrahamsson, P. (2014). Software development in startup companies: A systematic mapping study. *Information and Software Technology*, *56*(10), 1200–1218. https://doi.org/10.1016/j.infsof.2014.04.014
63. Pattyn, F. (2023) Improving Software Startup Viability: Addressing Requirements Prioritization Challenges Amid Increasing Interest Rates. Conference: 14th International, Conference on Software Business https://www.researchgate.net/publication/375186080_Improving_Software_Startup_Viability_Addressing_Requirements_Prioritization_Challenges_Amid_Increasing_Interest_Rates
64. Peng, S., Kalliamvakou, E., Cihon, P., & Demirer, M. (2023). *The Impact of AI on Developer Productivity: Evidence from GitHub Copilot*. https://doi.org/10.48550/arXiv.2302.06590
65. Puranam, P. (2021). Human–AI collaborative decision-making as an organization design problem. *Journal of Organization Design*, *10*(2), 75–80. https://doi.org/10.1007/s41469-021-00095-2
66. Raisch, S., & Krakowski, S. (2020). Artificial Intelligence and Management: The Automation-Augmentation Paradox. *Academy of Management Review*, 2018.0072. https://doi.org/10.5465/2018.0072
67. Raj, M., Berg, J., & Seamans, R. (2023). *Art-ificial Intelligence: The Effect of AI Disclosure on Evaluations of Creative Content*. https://doi.org/10.48550/arXiv.2303.06217
68. Rampersad, G. (2020). Robot will take your job: Innovation for an era of artificial intelligence. *Journal of Business Research*, *116*, 68–74. https://doi.org/10.1016/j.jbusres.2020.05.019
69. Sendak, M., Elish, M. C., Gao, M., Futoma, J., Ratliff, W., Nichols, M., Bedoya, A., Balu, S., & O'Brien, C. (2020). "The human body is a black box." *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency*, 99–109. https://doi.org/10.1145/3351095.3372827
70. Sergeeva, A. v., Faraj, S., & Huysman, M. (2020). Losing Touch: An Embodiment Perspective on Coordination in Robotic Surgery. *Organization Science*, *31*(5), 1248–1271. https://doi.org/10.1287/orsc.2019.1343
71. Shane, S., & Venkataraman, S. (2000). The Promise of Entrepreneurship as a Field of Research. *The Academy of Management Review*, *25*(1), 217. https://doi.org/10.2307/259271
72. Sjödin, D., Parida, V., Palmié, M., & Wincent, J. (2021). How AI capabilities enable business model innovation: Scaling AI through co-evolutionary processes and feedback loops. *Journal of Business Research*, *134*, 574–587. https://doi.org/10.1016/j.jbusres.2021.05.009
73. Sousa, M. J., & Wilks, D. (2018). Sustainable Skills for the World of Work in the Digital Age. *Systems Research and Behavioral Science*, *35*(4), 399–405. https://doi.org/10.1002/sres.2540

74. Statista Market Insights. (2024). Generative AI - Worldwide. Statista. https://www.statista.com/outlook/tmo/artificial-intelligence/generative-ai/worldwide (Retrieved 10/2 2024)
75. Susskind, R., & Susskind, D. (2018). The Future of the Professions. *Proceedings of the American Philosophical Society, 162*(2), 125–138. https://www.jstor.org/stable/45211625
76. Sutton, S. M. (2000). The role of process in software start-up. *IEEE Software*, *17*(4), 33–39. https://doi.org/10.1109/52.854066
77. Taylor, S.S., Fisher, D. & Dufresne, R.L. (2002). "The aesthetics of management storytelling: a key to organizational learning ". *Management Learning*, vol. *33, no.* 3. https://doi.org/10.1177/1350507602333002
78. Vázquez, M. S. (2012). The paradox of our outcomes, and the use of qualitative methodology as a way to understand the realities of emerging countries. *Open Journal of Nursing*, *02*(03), 222–225. https://doi.org/10.4236/ojn.2012.23034
79. Wasserman, N. (2012). *The Founder's Dilemmas*. Princeton University Press. https://doi.org/10.2307/j.ctvcm4hqc
80. Yue, T., Au, D., Au, C. C., & Iu, K. Y. (2023). Democratizing Financial Knowledge with ChatGPT by OpenAI: Unleashing the Power of Technology. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4346152
81. Zohaib, J., Ahamed, F., Mayer, W., Patel, N., Grossmann, G., Stumptner, M., & Kuusk, A. (2023). Artificial intelligence for industry 4.0: Systematic review of applications, challenges, and opportunities. *Expert Systems with Applications*, *216*, 119456. https://doi.org/10.1016/j.eswa.2022.119456

8. Appendix

Table 3 - Key Questions Explored During the Interviews

- *What is your perspective on AI in the context of software construction?*
- *What is your perspective on AI in the context of software maintenance?*
- *What is your perspective on generative AI in the context of team dynamics?*
- *What is your perspective on AI in the context of software development methodologies?*
- *Are there any challenges or opportunities that you have experienced from adopting generative AI as opposed to not using it?*
- *What is your opinion on how generative AI impacts risk of failure factors?*

Table 4 - Key Themes Explored During the Interviews

- *Software development*
- *Human capital*
- *Upskilling*
- *Reskilling*
- *Team dynamics*
- *Iteration cycles*
- *Funding*
- *Building an team*
- *Finding product-market fit*

AI Usage Disclosure

- General text formulation to be scientific, non-repetitive, correct spelling and referring to correct source gathered from our sources library
- Literature review analysis in finding common and opposing arguments as well as offering a fast start to writing the literature review through taking article summaries, developing blocks of information then puzzling them together within the literature review to best convey information on the topic
- Developing transcripts from voice recordings from the interviews
- Results coding and analysis in providing a second opinion on key themes that have come up during the interviews which we may have missed
- Text translation from interview transcripts which were first written as part of results being in English and quotes being in Swedish then later translating Swedish quotes pieces of text into English by putting them all into an AI tool